



February 4, 1999

**VIA FEDERAL EXPRESS**

Ms. Magalie Roman Salas  
Office of the Secretary  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20554

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Re: Petition to Waive Section 20.18(e) of the  
Commission's Rules  
CC Docket No. 94-102

Dear Ms. Salas:

Enclosed for filing on behalf of Aerial Communications, Inc., and its broadband PCS license holding subsidiaries, APT Columbus, Inc., APT Kansas City, Inc., APT Minneapolis, Inc., APT Houston, Inc., APT Tampa/Orlando, Inc., and APT Pittsburgh Limited Partnership, is an original and ten copies of a Petition to Waive Section 20.18(e) of the Commission's Rules.

Please date stamp the additional cover page marked "Copy" and return using the enclosed self-addressed, stamped envelope. You may direct any questions regarding this filing to Latrice Kirkland, Head of Industry Relations, Aerial Communications, Inc., (773)399-8846.

Sincerely,

  
Latrice Kirkland, Esq.

cc: Brian T. O'Connor, Esq.  
George Wheeler, Esq.

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List A B C D E

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FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554

In the Matter of )  
)  
Revision of the Commission's Rules ) CC Docket No. 94-102  
To Ensure Compatibility with ) RM-8143  
Enhanced 911 Emergency )  
Calling Systems )  
)  
Aerial Communications, Inc. )  
Request for Waiver of ) DA 98-2631  
Section 20.18(e) of the )  
Commission's Rules )

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To: The Wireless Telecommunications Bureau

**PETITION TO WAIVE SECTION 20.18(e) OF THE COMMISSION'S RULES**

Aerial Communications, Inc., on behalf of its subsidiaries APT Houston, Inc., APT Tampa/Orlando, Inc., APT Minneapolis, Inc., APT Columbus, Inc., APT Kansas City, Inc., APT Pittsburgh Limited Partnership (collectively "Aerial"), all of which are licensees of broadband Personal Communications Service (PCS) in the corresponding metropolitan trading area (MTA), pursuant to §22.119 and §24.819 of the Commission's rules and the Commission's Public Notice, released December 24, 1998, in the above-captioned docket ("Notice"), hereby request a waiver of application of Section 20.18(e) of the Commission's Rules for each of its license holding subsidiaries.

In support of this petition, Aerial respectfully states as follows:

1. Section 20.18(e) of the Commission's rules require that covered wireless carriers deploy Automatic Location Identification (ALI) as part of Enhanced 911(E911) service beginning October 1, 2001, provided certain conditions are met. Pursuant to the

rule, subject carriers are required to provide the location of all 911 calls by longitude and latitude such that the accuracy for all calls is 125 meters or less using a Root Mean Square (RMS) methodology.<sup>1</sup>

2. While the rule does not preclude carriers from using handset-based solutions to meet the ALI requirements, a waiver of the rule is necessary for carriers like Aerial that would prefer to use handset based solutions which would only be available to new or upgraded handsets. Because it may not be possible or economically feasible for Aerial to provide ALI for the embedded base of handsets that will not be upgraded or traded in by the compliance date, Aerial hereby requests a waiver of the rule.

A WAIVER PERMITTING THE USE OF HANDSET BASED SOLUTIONS IS IN  
THE PUBLIC INTEREST

3. The Commission has stated that, “the goal in this proceeding is to ensure the rapid, efficient, and effective deployment of ALI as part of E911, in order to promote the public safety and welfare.”<sup>2</sup> The Commission also has stated that it has the objective of being technologically and competitively neutral with respect to enforcement of compliance with its Phase II rules.<sup>3</sup> Handset based solutions will achieve all of the Commission’s goals.

4. According to information Aerial has received from various vendors, non-GPS handset based solutions will be significantly less costly than network based solutions.<sup>4</sup> Specifically, with current estimates, it would cost Aerial approximately \$5,000,000.00 with its current number of cell sites to implement a non-GPS handset based solution as

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<sup>1</sup> 47 C.F.R. §20.18(e)

<sup>2</sup> E911 Reconsideration Order, 12 FCC Rcd 22725 (para. 123) (1997).

<sup>3</sup> Notice at p. 4.

opposed to approximately \$41,000,000.00 to implement a network based solution. The lower costs of non GPS handset based solutions will allow for a faster deployment of the technology which will ultimately benefit the public. To the extent that most E911 cost recovery mechanisms are funded by the public, handset based solutions will be a lower tax burden to the public. Lastly, the lower cost of handset based technology, and hence the lower tax burden to the public, will allow a greater number of PSAPs to request and offer ALI to the public.

5. In addition, Aerial would like to suggest to the Commission an additional means by which the cost of deploying any ALI technology could be reduced for wireless carriers. The availability of an accurate, absolute time reference is vital to any ALI positioning method. The cost to carriers of distributing such an accurate time reference throughout the network can be large. With knowledge of the GPS precision codes (P-codes), however, a single satellite in the GPS system is able to provide a timing reference that is accurate to the required levels. The GPS P-codes are controlled by the Department of Defense and are not readily available to carriers. The Commission would be able to facilitate even more cost effective ALI solutions for all carriers by making these GPS P-codes available to carriers for use in their networks for ALI purposes.

6. Handset based solutions will also promote the public safety and welfare. Due to the shrinking product lifecycles of PCS digital handsets, handset based solutions will stimulate the evolution of advanced ALI technology. As PCS digital handsets become more advanced, so too will ALI technology embedded in the handsets. The much shorter product lifecycles of handsets in comparison to networks (18 months vs. 10 years)

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<sup>4</sup> See attached letter from Nokia to Aerial dated February 3, 1999.

encourage and allow multiple technology solutions within the same network and open competition up to multiple vendors. Also handset based solutions are a more suitable platform on which to build value added services for the end user involving positioning, thus encouraging the further development of location technology.

7. Handset based solutions also meet the Commission objective of achieving technological and competitive neutrality. First of all, handset based solutions give carriers subject to Section 20.18(e) of the rules more than one option in becoming compliant. Secondly, lower cost handset based solutions promote competitive neutrality between wireless carriers. Carriers with smaller customer bases generally must have similar numbers of cell sites as carriers with larger customer bases to cover their licensed areas. Because the cost of a network based solution is driven by the number of cell sites, the costs of a network based solution will be similar for all carriers, regardless of the size of their customer base. Carriers with smaller customers bases, however, have a much smaller set of customers over which to spread the costs and hence are disadvantaged by higher cost network based solutions. Aerial urges the Commission to grant this waiver request to provide Aerial with the widest range of technological and competitive options possible.

#### THE LEVEL OF ALI ACCURACY AND RELIABILITY AERIAL PLANS TO OFFER

8. Aerial understands that there are issues regarding handset based solutions that the Commission has asked carriers requesting waivers to address. The first issue to address is the level of ALI accuracy and reliability Aerial plans to offer with handset based ALI technology.

9. The simulations and localized field trials that have been conducted for network based and handset based ALI solutions show no appreciable difference in the accuracy afforded by the two types of methods. Aerial believes that there would be no loss of accuracy due to implementing a handset based ALI solution. Therefore, Aerial expects to be able to offer the same level of accuracy with a handset based solution as is available in a network based solution.

#### WHEN AERIAL PLANS TO OFFER ALI CAPABLE HANDSETS

10. Aerial's vendors have advised that handsets capable of ALI will be available in the marketplace approximately eighteen months from the date of the specification by standard setting bodies.<sup>5</sup> Under the current industry standards schedule, the specification should be completed by mid 1999. Accordingly, Aerial is able to target January 1, 2001, as the introduction date of ALI capable handsets. The introduction of handsets nine months before the October 1, 2001, deadline will allow Aerial to begin to place ALI-capable handset into the marketplace before the deadline.

#### STEPS AERIAL WILL TAKE TO MINIMIZE THE IMPACT OF NON-ALI CAPABLE HANDSETS

11. Aerial launched its first commercial PCS service in the Columbus MTA on March 27, 1997, and launched commercial PCS in the Tampa area, in its sixth and last MTA on June 23, 1997. Aerial was unable to launch commercial PCS in the Orlando area until November 10, 1997 due to zoning moratoria. Given that Aerial has been providing service to the public for a little less than two years, Aerial's customer base is

relatively small. This fact combined with existing handset churn rates, projected subscriber growth and the expected availability of ALI capable handsets, means that the percentage of non-ALI capable handsets in use will naturally and rapidly decline in the future.

12. Using average cellular and PCS industry churn rates, Aerial estimates that at the compliance date the percentage of non-ALI capable handsets in use in our PCS network will be about fifty percent.<sup>6</sup> Within three years from the compliance date the percentage of non-ALI capable handsets in use in Aerial's PCS network will be less than ten percent. Using a churn rate more typical of PCS carriers, namely four and a half percent churn per month, the percentage of non-ALI capable handsets in use in Aerial's PCS network will be about thirty-three percent by October of 2001. Within three years from the compliance date, the percentage of non-ALI capable handsets in use in Aerial's PCS network will be less than two percent in the total subscriber base.

13. In addition, existing handset and network functionality can be utilized to provide ALI information for non-ALI capable handsets. The existing functionality can be utilized to provide positioning that exceeds the Commission's E911 Phase I requirement; however, this functionality does not meet the current Phase II ALI requirement. Aerial believes that providing PSAPs with more than cell identity is consistent with the intended use of ALI by the PSAPs because the level of accuracy that can be provided for non-ALI capable handsets, while not to the level of the Phase II requirement, will be sufficient to

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<sup>5</sup> Letter from Nokia.

<sup>6</sup> *Cellular/PCS Churn: A Carriers Worse Nightmare*, Julie Reitman, p.18 (1998).

allow emergency services operators to dispatch personnel immediately to the caller's vicinity while the operator obtains specific address information from the caller.

14. Furthermore, Aerial plans to notify all customers of the existence of ALI-capable handsets and offer those subscribers with non-ALI capable handsets an option to upgrade their handset.

#### STEPS AERIAL WILL TAKE TO ADDRESS ROAMERS

15. Currently, due to the variety of digital technologies being used in the United States, the number of roamers in Aerial's networks is relatively small. Nevertheless, the same techniques described to deal with non-ALI capable handsets are applicable for dealing with roamers and positioning them in excess of the Phase I cell site location requirements. The existing network and handset functionality described above can be used to support any non-ALI capable handsets that should roam onto an Aerial network.

16. Aerial is participating with other PCS operators and key handset manufacturers to advance mandatory standards and specifications for all handsets to support ALI. Therefore, roamers from networks using network solutions will have the benefit of ALI on networks configured like Aerial's.

#### AERIAL REQUESTS A MODIFICATION OF THE CURRENT E911 PHASE II ALI ACCURACY REQUIREMENT

17. Unrelated to Aerial's request for waiver of application of Section 20.18(e) of the Commission's Rules concerning non-ALI capable handsets, Aerial respectfully requests that the Commission modify the current E911 Phase II ALI accuracy



requirement. This request for a modification is not related to any particular ALI positioning method and is not specifically related to either handset based or network based positioning methods.

18. As the Commission noted in the Notice of Proposed Rulemaking in this proceeding released in October of 1994, there are several possible methods available to provide location data with varying degrees of accuracy, affordability, and implementation problems. The Commission recognized at that time that “GPS does not work well if a caller is inside a building or amid obstructions that attenuate or block the satellite radio signals. Terrestrial radio triangulation methods are also hampered by interference and by signal reflection (multipath), though they are not as affected as satellite communications by attenuation inside buildings.”<sup>7</sup>

19. In the five years since the above statements were made, Aerial is aware of no wide scale field trials made of either handset or network based solutions that can prove that any method meets the current FCC 125 meter RMS requirement in all environments.

20. All methods, both handset and network based, use an estimation of distance based upon the travel time of a signal between points. As a result, the multipath effects that are commonly seen in the radio environment, especially in urban environments, will cause a degradation in the accuracy of all methods (including GPS methods). In addition, all methods, both handset and network based, rely on the coverage of multiple transmitters or receivers to triangulate a position. As a result, areas that are difficult radio

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<sup>7</sup> Notice of Proposed Rulemaking, 9 FCC Rcd 6170 (para. 46) (1994).

coverage situations, such as indoor areas, will cause a degradation in the accuracy of all methods.

21. No carrier can control, or predict, where calls in their network will originate from. A percentage of the wireless E911 calls placed, however, will naturally originate in urbanized environments where people are likely to use their wireless phones. In these particular environments, any positioning method will be compromised. Therefore, in these particular environments it will be most difficult to guarantee the accuracy of any positioning method.

22. Due to the practical limitations described above, Aerial believes it will be very difficult for carriers to guarantee compliance with the Commission's stated accuracy requirement of 125 meters RMS for all users in all environments and conditions. To ensure a clear compliance with the Commission's ALI requirements and to account for the above described problems with multipath, Aerial suggests that the Commission consider framing the ALI accuracy requirement in terms of measurable coverage and service situations. Aerial suggests a modification of the accuracy requirements to 200 meters 67 percent of the time for use of ALI in a motor vehicle.<sup>8</sup> A defined environment would give the Commission and carriers a means of measuring compliance.

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<sup>8</sup> Aerial would also like to point out that the current level of accuracy being required in Phase II is very close to the civilian accuracy limit of the GPS system under optimal operating conditions (100 meters @ 95%). *Global Positioning System Overview*, Peter H. Dana, Department of Geography, Univ. of Texas (1998). Under a wider range of conditions (urban areas, indoors etc.); however, the standard GPS system's accuracy can be degraded another 100 meters. *Multipath effects on GPS Code Phase Measurements*, Richard D. J. Van Nee, Delft University of Technology (1992). In addition, in some specific environments, such as urbanized environments, positioning by the GPS system is not possible. Aerial believes it is somewhat unreasonable to require communications systems to deploy location technology that exceed that of a system designed solely to provide accurate user location.

## CONCLUSION

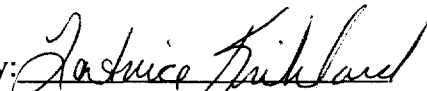
In sum, Aerial believes grant of a waiver to permit Aerial to use a handset based solution to meet Phase II requirements is in the public interest. Handset based solutions will achieve the Commission's goals of ensuring the rapid, efficient, and effective deployment of ALI as part of E911, in order to promote the public safety and welfare and provide Aerial with the widest range of technological options available.

Accordingly, for the foregoing reasons, Aerial respectfully requests that the Commission grant its subsidiary license holders APT Houston, Inc., APT Tampa/Orlando, Inc., APT Minneapolis, Inc., APT Columbus, Inc., APT Kansas City, Inc. and APT Pittsburgh Limited Partnership with waivers of the applicability of Section 20.18(e) of the rules to non-ALI capable handsets .

Also unrelated to the legacy handset waiver above, Aerial respectfully requests that the Commission modify the ALI accuracy requirement to 200 meter 67 percent of the time. This request is independent of any particular positioning method. In addition, Aerial also respectfully requests that the Commission define the accuracy requirement specifically for performance in motor vehicles. This will enable carriers to measure their compliance with the ALI requirement.

Respectfully submitted,

**Aerial Communications, Inc.**

By:   
Brian T. O'Connor, Esq.  
Vice President External Affairs  
Latrice Kirkland, Esq.  
Head of Industry Relations  
8410 West Bryn Mawr, Suite 1100  
Chicago, IL 60631

Date: February 4, 1999

Account Management

February 3, 1999

Mr. Robert Rowe  
VP, Network Design / Technology  
Aerial Communications, Inc.  
8410 West Bryn Mawr Avenue  
Chicago, Illinois 60631-3486

Re: E911 / MS Location information

Dear Mr. Rowe,

With regards to Aerial's inquiries I am pleased to present the following advance (preliminary) information:

## 1. Cost comparison for TOA method vs. OTD method.

NOKIA: the following assumptions are made with the resulting cost figures:

TOA:

implementation utilizes high gain BTS antennas  
each cell site consists of 3 BTS i.e. 3 sectors per cell site (n+n+n base station)  
1 LMU per cell site  
each LMU = 6 Rx (3 main / 3 div.) per 3-sector site (1 main / 1 div. per BTS)  
separate outdoor antenna for GPS and RTD measurement

E-OTD: utilizes single omni antenna for GPS and RTD  
1 LMU *for every second* site (50%)  
GPS/RTD antenna installed with LMU

PRICING 1 MSC, 7 BSC'S, 1 COMBINED SMLC/GMLC,  
100K SUBS., 400 CELL SITES (1200 BTS)  
Network costs = NSS software, BSS software, MLC  
Site costs = GPS/RTD antenna, feeder cable, rigging work  
LMU costs = price for LMU network component  
Note - costs do not include O&M (NMS) incremental costs which may be necessary

### TOA

Network Costs =	\$1480K
LMU =	\$12000K
Site costs =	<u>\$2400K</u>
TOTAL	\$15.88M

### E-OTD

Network Costs =	\$920K
LMU =	\$1000K
Site costs =	<u>\$540K</u>
TOTAL	\$2.46M

Price / BTS* =	\$13,233	\$2,050
Price / cell site* =	\$39.7K	\$6.15K

\* BTS & cell site prices will vary as a function of the number of BTS/cell sites in the network.

Account Management

February 3, 1999

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## 2. Timetables for OTD implementations in handsets.

NOKIA: E-OTD capable MS will be available roughly 18 months after the standard is fully completed provided that E-OTD is a mandatory requirement in the specification for GSM1900 phones. E-OTD will be introduced into new handset models from that date onwards. Old models will not be updated.

**THE INDICATED TIMEFRAME IS OFFERED SOLELY AS AN *ESTIMATE* OF POSSIBLE PRODUCTION AVAILABILITY. THIS INFORMATION SHOULD NOT BE CONSTRUED AS ANY COMMITMENT TO PROVIDE OR INTENT TO PRODUCE OTD-CAPABLE HANDSETS. NOKIA MAKES NO COMMITMENT TO PRODUCE SUCH PRODUCTS AND RESERVES THE RIGHT TO CHANGE THE AVAILABILITY AT ANY TIME OR FOREGO ANY SUCH POSSIBLE DEVELOPMENT.**


## 3. Accuracy estimations for OTD.

NOKIA: The simulations presented in T1P1 show that E-OTD and TOA can fulfil the 67% accuracy limit in a majority of environments. Also the field tests made by Nokia indicate that E-OTD has the potential to fulfill a 67% accuracy limit in many environments. However, due to different environments, different network planning practices and practical implementation constraints the accuracy of E-OTD and TOA in a real environment is very difficult to predict. It is expected that the accuracy of E-OTD and TOA will vary significantly. A 67% limit can probably be achieved in many cases, but in some environments and areas it may not be achieved.

**THIS INFORMATION SERVES ONLY AS AN ESTIMATE BASED ON THE LIMITED INFORMATION AVAILABLE AT THIS TIME.**

Please contact me if you should have any questions regarding this information

Sincerely,



Greg Gingras  
Director, Account Management

Cc: Beth Frasco / Aerial